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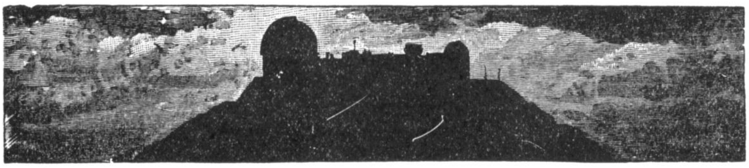

NOTES FROM PACIFIC COAST OBSERVATORIES.

FORMULÆ FOR SPECTROSCOPIC BINARY ORBITS OF SMALL ECCENTRICITY AND FOR SYSTEMS SHOWING TWO SPECTRA.

In the determination of nearly circular spectroscopic orbits the usual graphic and differential formulæ become difficult of application for the evaluation of the small eccentricity and the angle of periastron. The present paper contains new adaptations of the differential and analytic formulæ for use in the case of small eccentricity. Moreover, for the case when two spectra are visible so that measures of velocity of both component masses are available, a new combination of formulæ is suggested for the purpose of employing both velocities and for the derivation of a consistent system of elements of the component orbits.

From the two equations representing the velocity in the line of sight of the two masses respectively of a binary system are derived: first, the equation containing as unknowns the radial velocity of the center of mass and the ratio of masses; second, the equation containing the orbital elements. The first equation and the differential of the second have been adapted to convenient application and computation and into both may be entered simultaneously the measured velocities of both component masses. The resulting series of equations are to be solved by least squares for the quantities mentioned. For the case of very small eccentricity, the second equation has been developed analytically into a particular form of Fourier series in terms of the small eccentricity and multiples of a phase angle reckoned from an arbitrary epoch. An endeavor has been made to include all second order terms, but the result shows that only part of these may be retained in a least squares solution. Special adaptations for convenient computation have been introduced. The total result is a form of rigorous solution by least squares for the eccentricity and the angle of periastron without a preliminary assumption of their values.

The developments here given were suggested by the problem presented by the spectroscopic binary v_4 *Eridani,* which shows two spectra the measures of which indicate nearly circular orbital motion. Altho the method requires more than usual accuracy in the observed velocities, it has been applied to this binary system for the purpose of illustration. The results together with a discussion of the physical constants of the system are given in the following paper.

This paper has been published in full in Lick Observatory Bulletin, No. 274. G. F. PADDOCK.

THE SPECTROSCOPIC BINARY v_4 ERIDANI.

The binary system of v_4 *Eridani* gives two equally bright spectra of Class B9. The hydrogen line Hγ at 4340A is strong and broad and not always measurable. The magnesium line at 4481 A is strong and fairly well defined. Many faint lines are visible on those plates on which the two spectra are coincident. From one of these plates the wave-lengths and identification of 40 lines were determined, showing that the spectrum contains besides hydrogen the enhanced lines of iron, titanium, manganese, chromium, and magnesium. The spectrum is essentially Sirian.

Of the 61 plates obtained of this binary, 39 showed the two magnesium lines at 4481 A distinctly separated. The measures of these alone were used for the solution of the orbit, which was obviously nearly circular. For the derivation of the small eccentricity and nearly indeterminate angle of periastron, the analytic formulæ of the preceding paper were employed. The circumstance that the observed velocities were not sufficiently accurate for the application of these formulæ was set aside in order to illustrate the methods. Two least squares solutions were performed, one for the velocity of the system and ratio of the masses, and one for the orbital elements, with the result that the elements are given for the system and for each component mass on a consistent basis. A comparison of these elements with those of other binary systems shows that this system is one of average and normal values.